EXHIBIT B

UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

ORACLE, INC.	)	
Plaintiff,	)	
v.	)	Case No. CV 10-03561 WHA
GOOGLE INC.,	)	
Defendant.	)	

HIGHLY CONFIDENTIAL

EXPERT REPORT OF DR. GREGORY K. LEONARD

CORRECTED (MARCH 10, 2016)

d. Incremental Android-Related Profit Attributable to the Alleged Infringement, Assuming No Costly Google Actions

185. As discussed above, the alleged infringement generated cost-savings for Google by allowing Google to avoid taking certain costly actions. If Google did not take such actions and did not allegedly infringe, Oracle's claim is that there would have been fewer Android apps and this would have impacted Android device sales and therefore the Android-related profits. In this section, I measure these effects.

186. I have applied the Kim (2013) empirical model of smartphone demand conservatively to estimate the decrease in Android handset sales that would have occurred in a counterfactual where there were fewer Android apps, as well as the percentage of this Android sales decrease that would have been captured by the iPhone. Google would earn ad revenue on these additional iPhone units.

187. In the model, the Android share satisfies (after application of the Berry (1994) inversion)[279]

$$\ln(s_A) - \ln(s_0) = \delta_A + \sigma\ln(s_{A|A,I})$$

where s_A is the Android share, s_0 is the share of the outside good, δ_A is the mean utility level for Android (based on the right-hand-side of equation (2.3) of Kim (2013)), and $s_{A|A,I}$ is Android's share of a nest consisting of Android and iPhone. iPhone share is defined analogously as

$$\ln(s_I) - \ln(s_0) = \delta_I + \sigma\ln(s_{I|A,I})$$

Blackberry share is defined as

[279] S. Berry, Estimating Discrete-Choice Models of Product Differentiation, Econometrica (1994). In these equations, I omit notation related to time for clarity. The analysis is conducted on a monthly basis.

$$\ln(s_B) - \ln(s_0) = \delta_B$$

and the share of the outside good is defined as $s_0 = 1 - s_A - s_I - s_B$.

188. Given data on shares and the value of σ[280], the three mean utility levels δ_A, δ_I, and δ_B can be solved for.

189. In the counterfactual where some Android apps are not available, the Android app value variable in the Kim (2013) model (I will call it V_A) takes on a different value from its actual value. Given a set of available Android applications, V_A is defined as

$$V_A = \sum_{k=1}^{K_A} \ln(1 + \exp(\theta_k))$$

where K_A is the number of available Android apps and θ_k is the mean utility level for app k (based on equation (2.7) of Kim (2013)). V_A is well approximated as[281]

$$V_A = \sum_{k=1}^{K_A} \ln(1 + \frac{s_k}{1 - s_k})$$

The decrease in V_A (i.e., the decrease in the Android app value variable) given a smaller set of available Android applications is

$$\Delta_A = \sum_{k \in M} \ln(1 + \frac{s_k}{1 - s_k})$$

where M represents the subset of apps assumed not to be available in the counterfactual. Then, the counterfactual value of the Android mean utility level δ'_A can be calculated as

$$\delta'_A = \delta_A + \beta \Delta_A$$

[280] Kim (2013) estimated this parameter to be 0.757.

[281] In a binary logit model, the aggregate share $s = \exp(\theta) / (1 + \exp(\theta))$ where θ includes an unobserved app quality effect, as in the app demand model in Kim (2013). Then, by the Berry (1994) inversion, $\exp(\theta) = s/(1 - s)$.

where β is the coefficient on V_A.[282] The iPhone and Blackberry mean utility levels do not change in the counterfactual.[283]

190. The counterfactual shares can be calculated by solving the following system of equations.

$$\ln(s_A') - \ln(s_0') = \delta_A' + \sigma \ln(s_{A|A,I}')$$

$$\ln(s_I') - \ln(s_0') = \delta_I + \sigma \ln(s_{I|A,I}')$$

$$\ln(s_B') - \ln(s_0') = \delta_B$$

$$s_0' = 1 - s_A' - s_I' - s_B'$$

191. In the Kim (2013) model, the variables are defined as follows.

- The share of a smartphone OS in a given month is defined as the U.S. unit handset sales in that month divided by the U.S. population over the age of ten. I used U.S. unit handset sales data from ITG and U.S. population data from the U.S. Census.

- An app's share is defined as the number of downloads of the app in a given month divided by the handset sales of the OS in that month. I obtained app download data from AppAnnie. These data cover the period January 2012 to December 2015. Kim (2013) identified the set of available apps for Android and iPhone based on top paid and free app lists. I used the same approach.

192. For each Android app, I determined whether (1) it is a Google app, (2) it was written using the NDK, (3) it was multi-homed on iOS, (4) its developer also developed apps for iOS, or (5) its developer also developed NDK Android apps. Any app in one or more than one of these categories is assumed to be available on Android in the counterfactual. Apps in none of

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282 Kim (2013) estimates this parameter to be 0.01.

283 Note that, in the context of this model, determining the effect of a change in a single explanatory variable (in this case the Android app value variable) requires knowledge only of the actual value of that variable, its coefficient, the nesting coefficient, and the actual shares of each of the operating systems. It is not necessary to know the values of the other individual explanatory variables; their combined value is all that is needed and this can be determined through the Berry (1994) share inversion.

these categories are assumed to be unavailable in the counterfactual. This is conservative because apps not in one of these categories may well have been developed anyway. For example, many apps not in these categories have close counterparts on Microsoft Phone, which has much smaller user base than Android.[284] Based on this assumption, the counterfactual shares are calculated as described above.

193. Given the counterfactual shares for each month, I calculate (1) the decrease in Android's sales and (2) the increase in iPhone sales in the counterfactual relative to their actual levels.[285] I then take appropriately weighted averages to calculate by year (1) the percentage Android sales decrease in the counterfactual and (2) the percentage of the Android sales decrease in the counterfactual that is captured by the iPhone (the "diversion ratio").[286]

194. The calculations described above are based on U.S. shares. I repeated the exercise after adjusting the shares to reflect rest of world (ROW) shares. Because the iPhone's ROW share is lower than its U.S. share, the ROW diversion ratio is lower and the Android unit loss percentage is lower.[287] The U.S. and ROW diversion ratios and Android unit loss percentages are averaged using Google U.S. and ROW Android-related ad revenues as weights,

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[284] Exhibit 2i.

[285] Exhibit 3d.3~~4~~. In principle, there could be "feedback" from the decrease in users to apps, which could then lead to a further decrease in users. However, this feedback effect is negligible for several reasons. First, the initial decrease in users is small, so any feedback effect would likewise be limited in size. Second, given that developers focus on return on investment, the initial small decrease in users would affect only those apps that are marginal, i.e., those just on the boundary of being profitable. But, these apps by definition are those with a very low user share and thus their absence would have little additional effect on the number of users.

[286] Apple would have had time to expand its supply of iPhones and, indeed, the capacity in the various component industries made available by the lower Android handset sales could have been utilized by Apple.

[287] Exhibit 3d.3~~4~~.

yielding a percentage loss and diversion ratio that can be applied to Google Android-related ad revenue. I similarly calculate a percentage loss that can be applied to Google Play revenue.

195. I then apply the percentage loss in revenue and diversion ratio figures and calculate the appropriate costs to determine the apportionment of the Android-related profits to the alleged infringement, assuming Google does not take any of the costly actions described in the previous sections.[288] I find this figure to be no more than $203 million. For the reasons described above, it is highly conservative.

196. The appropriate measure of the apportionment of Google's Android-related profits to the alleged infringement using the bottom-up approach is the minimum among the three cost-savings and the profit loss.

2. Top Down Approaches: Application of an Apportionment Percentage to the Android-Related Profits

197. In contrast to the "bottom up" approaches to apportionment discussed above, a "top down" approach to apportionment involves identifying the percentage of the Android-related profits that should be attributed to the alleged infringement as opposed to the contributions of other parties and factors, and then applying this percentage to the Android-related profits.

198. I have taken two approaches to top down apportionment. Under the first approach, in a first step I apportion between Android, on the one hand, and Google's search and ad technologies and services, on the other, as described above. This yields a $1.9 billion apportionment of profit to Android. In a second step, I apportion between the 37 API packages,

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[288] Exhibit 3d.1.

extent Oracle is contending that Sun's Java ME licensing business was harmed by Google's use of a small fraction of the technology contained in the Java SE platform, that harm likely would have occurred anyway as a consequence of Sun's decision, before Android's release, to open source the entire Java SE platform, and cannot be attributed to Android.

VIII. Awarding Lost Profits in Addition to Unjust Enrichment Would Double-Count Damages

283. I understand that a plaintiff asserting copyright infringement may seek recovery of both the unjust enrichment to the alleged infringer and any actual damages suffered by the copyright owner, such as lost profits, as long as the latter are not duplicative of the former.

284. Here, the claimed actual damages are Oracle's lost profits arising from claimed lost Java ME licensing revenues. The claimed lost Java ME licensing revenues, in turn, arise from claimed displacement of Java ME by Android. Thus, the claimed lost Java ME profits are the flip side of the Android profits that Oracle claims as unjust enrichment. Accordingly, it would be duplicative to award both the claimed actual damages consisting of Java ME lost profits and the claimed unjust enrichment.

Gregory K. Leonard
~~February 8~~March 10, 2016